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THE MARINE TERTIARY STRATIGRAPHY OF THE NORTH PACIFIC COAST OF NORTH AMERICA.

Review of an article by Ralph Arnold and Herold Hannibal.

By ALBERT B. REAGAN.

I HAVE not the time to review the whole of the above-cited article of Ralph Arnold and Herold Hannibal, but will touch only the part that relates to my article, "Some Notes on the Olympic Peninsula, Washington." (Transactions of the Kansas Academy of Science, vol. XXII, 1908, pp. 131 to 238.)

In the article of the two gentlemen cited, page 604 (Reprint from Proceedings of the American Philosophical Society, vol. LII, No. 212, November-December, 1913) is this paragraph:

> "A. B. Reagan, 1908, 'Some Notes on the Olympic Peninsula.' Most of the geological data in this paper are adopted from one by the senior writer (Arnold) mentioned. . . . The description of the Quillayute formation is based on the glacial filling of the valley of the Quillayute river. If Reagan had visited the locality from which the fossils he describes from the Quillayute formation were brought by the Indians, he would have found it to be about two miles from Devil Club swamp, where he says they occur, and the formation lithologically very different from what he describes. It is typical Empire formation."

I will take up Mr. Arnold's misstatements as they come:

> "Most of the geological data in this (Reagan's) paper are adopted from one by the senior writer (Arnold)."

I had done my geological research work and was at Leland Stanford, Jr., University classifying the fossils described in my article when Prof. J. P. Smith (I believe it was) gave me Mr. Arnold's article on the Olympic Region (Geological Reconnaissance of the Coast of the Olympic Peninsula, Washington; Bul. Geol. Soc. America, vol. 17, pp. 451-468, vols. 55, 56.) In the final writing up of the article I did quote from this article, and wherever I did I gave Mr. Arnold due credit for the same, as the article shows; but that most of the data was adopted from Mr. Arnold is preposterous. Mr. Arnold's whole article covers pages 451 to 468, or a total of 18 pages, and my article cited covered from pages 131 to 238, or a total of 108 pages, besides plates. Had I copied Mr. Arnold's article *in toto* it would have been only a small fraction of my article. Furthermore, I described the Quillayute and interior region of the peninsula, which Mr. Arnold touched only slightly, if at all.

> "If Reagan had visited the locality from which the fossils he describes were brought by the Indians, he would have found it to be about two miles from Devil Club swamp, where he says they occur, and the formation lithologically very different from what he describes. The (Reagan's) description of the Quillayute formation is based on glacial filling of the valley of the Quillayute river. (But) it is typical Empire sandstone." (Written in reverse order to bring out Mr. Arnold's statements.)

I am sorry Mr. Arnold never read my article. He can read the English language, I am sure; and if he ever read my article he certainly would not have made the statement above quoted. My article is in your libraries, and I beg you to please get down the volume cited and see for yourselves that the statements above are far from justice to me.

I visited the region and collected the fossils described myself, with the exception of the fossil *Ranella marshalli,* which was given me by Mr. Marshall, as is stated on page 224 of the article. I made a good many trips to the place, both with white men and with Indians. We went both by canoe up the river and also on foot in from Quillayute prairie. James Clark, now county commissioner of Clallam county, Washington, accompanied me on the first trip. George Woodruff, now of Ilwaco, Washington, was with me on another trip. On practically all the trips I crossed the Devil Club swamp from the bend in the river to the bluffs adjacent and north of where Maxfield creek entered the Quillayute river when that river ran against the western bluffs, instead of about a half a mile eastward as it does now (at the old mouth of Maxfield creek; not a later mouth of Maxfield creek). *There is not a statement anywhere in my article that a fossil was obtained in the Devil Club swamp or any material of which the Devil Club swamp is composed.*

I will now quote from page 203 of my article:

> "*Quillayute Formation* [This is under the general heading 'Pliocene,' on page 202]. This formation occupies the valley of the Quillayute river and the country drained by its eastern tributaries at least to their respective middle courses, thence westward to Wasatch strait, the formation extending outward to the coast now and then. The boundaries of the formation were not ascertained. In the interior region, where exposed along the Bogachiel river, it is composed of sandstone and bluish-gray shale; the coast exposures are all conglomerates or a coarse gravelly rock resting unconformably upon the older rocks exposed there.

The base of the formation was not seen in the interior region. The thickness of the formation, consequently, was not ascertained. The sandstone series was found to be extremely fossiliferous, and in it the fossils are beautifully preserved. Fossils were found at two horizons—in the north bank of the Bogachiel river in a bluish-gray rock in section 22, township 28 north, range 14 west of the Willamette meridian, and *in the bluff south of the abandoned channel of Maxfield creek* on the south side of the Bogachiel river, in sections 28 and 29 of the township and range above. But fossils were obtained only from the latter location, as the former was below the surface of the water of the river at the time visited. Below is a description of the fossils obtained.

"Fossils of the Quillayute Formation (Lower? Pliocene) Exposed in the Vicinity of Quillayute, Wash." [There follows a two-page comparison of the Quillayute formation fossils with the fossils of other regions, with the final conclusion, page 205, that:] "Consequently, this [the comparison-results] would seem to place the formation at the bottom of the Pliocene. Following is a description of the fossils." [Here follow twenty-two pages—from pages 205 to 226—describing the fossils of the Quillayute formation.]

I am unable to find anything in my article that states that the Quillayute fossils described by me were found in a Devil Club swamp or that they were found in glacial drift. Moreover, on page 589 (of the cited article) Messrs. Arnold and Hannibal state that the Empire formation in the Empire district, Oregon, is composed of "about 500 feet of beds, sandstones at the base, grading upward into massive shales, partially organic in character."

To quote from my article, paragraph on the Quillayute formation above mentioned (page 203): "In the interior region, where exposed along the Bogachiel river, it (the Quillayute formation) is composed of sandstone and bluish-gray shale; the coast exposures are all conglomerates or a coarse gravelly rock resting unconformably upon the older rocks exposed here."

My description, accompanied by the description of fossils obtained, shows conclusively that the Quillayute formation is a typical Empire sandstone and shale.